

ANGLE ADJUSTING DEVICE FOR A CHAIR

1 BACKGROUND OF THE INVENTION

2 1. Field of the Invention

3 The present invention relates to an angle adjusting device, and more
4 particularly to an angle adjusting device for a chair to adjust the backrest angle
5 relative to the seat.

6 2. Description of Related Art

7 With reference to Fig. 6, a conventional chair adjusting device (50) is
8 adapted to be mounted between a seat (A) and a backrest (B) to allow the
9 backrest (B) to change its angle relative to the seat (A).

10 With reference to Figs. 7 and 8, the adjusting device (50) includes a fixed
11 plate (51) adapted for engaging with the seat (A) of the chair and a moving plate
12 (52) adapted for engaging with the backrest (B) of the chair. Furthermore, a U-
13 shaped fixed frame (511) is fixed in the front portion of the fixed plate (51) and a
14 U-shaped moving frame (512) is connected to the bottom of the moving plate
15 (52). Two arcuate slots (513) are respectively and oppositely defined in a side
16 face of the fixed frame (511) and two through holes (514) are also respectively
17 and oppositely defined in the side face of the fixed frame (511) to receive therein
18 a first pin (515) which extends into a mediate portion of the moving plate (52). A
19 second pin (516) is received in the two arcuate slots (513) and is extended into
20 the bottom portion of the moving plate (52). A post (518) has a first distal end
21 securely connected to the fixed frame (511) and a second distal end securely
22 connected to the second pin (516). A spring (517) is sandwiched between the

1 fixed frame (511) and the moving frame (512).

2 When the conventional adjusting device is in application, that is, the
3 operator is sitting on the chair and leaning on the backrest to apply a force to the
4 moving plate (52), the moving plate (52) is pivoted about the first pin (515) and
5 the bottom portion of the moving plate (52) moves along the arcuate slots (513)
6 due to the second pin (516) being extended into the bottom portion of the moving
7 plate (52) and received in the arcuate slots (513). Meanwhile, due to the
8 movement of the bottom portion of the moving plate (52), the moving frame
9 (512) moves toward the fixed frame (511), which compresses the spring (517) in
10 a longitudinal direction of the post (518) to provide a damping effect to the force
11 to the moving plate (52) so that the operator is able to slowly stretch out in a
12 slanted position when the angle between the moving plate (52) and the fixed
13 plate (511) becomes bigger and bigger.

14 However, the inclination of the moving plate (52) depends entirely on
15 the force applied to the moving plate (52). That is, if the force applied to the
16 moving plate (52) is removed, the moving plate (52) will be sprung back to its
17 original position, which means that the adjusting device can not provide a
18 positioning mechanism to maintain the position of the moving plate (52) relative
19 to the fixed plate (511) and the operator will have to apply a force to the moving
20 plate (52) every time the operator wants to have a relaxed sitting position.

21 In order to overcome the conventional drawback, a manufacturer
22 introduced another kind of adjusting mechanism.

23 With reference to Figs. 9 and 10, a different conventional adjusting

1 device (60) is shown and has a fixed plate (61) adapted for engagement with the
2 seat (A) of the chair and a moving plate (62) adapted for engagement with the
3 backrest (B). The fixed plate (61) has an arcuate slot (611) defined in opposite
4 sides of the fixed plate to receive therein a first pin (612) which extends into the
5 bottom portion of the moving plate (62). A second pin (613) is provided to
6 extend through the opposite sides of the fixed plate (61) and into a mediate
7 portion of the moving plate (62) to allow the moving plate (62) to pivot relative
8 to the fixed plate (61) using the second pin (613) as the pivotal center.

9 A shaft (613a) is pivotally connected to the first pin (612) and is
10 extended through a housing (614) securely formed inside the fixed plate (61) and
11 is mounted with a spring (615). Two limiting blocks (616) are also loosely
12 mounted on the shaft (613a) and received in the housing (614) to be abutted by
13 the spring (615) such that due to the abutment of the spring (615), one side face
14 of each of the limiting blocks (616) is slanted inside the housing (614). A control
15 rod (617) is extended from a side of the fixed plate (61) and into the housing
16 (614). An extension (618) is axially formed on the control rod (617) to
17 selectively engage with the side face of one of the limiting blocks (616).
18 Therefore, when the operator is operating the control rod (617) to drive the
19 extension (618) on the control rod (617) to engage with the side face of one of
20 the limiting blocks (616) so as to render horizontal the slanted side face of the
21 limiting block (616), the moving plate (62) is able to move relative to the fixed
22 plate (61). When the angle of the moving plate (62) reaches a satisfactory
23 position, the operator releases the control rod (617) to allow the side face of the

1 limiting block (616) to be obliquely positioned again. Therefore, due to the
2 slanted side face of the limiting block (616), the shaft (613a) is blocked from
3 movement relative to the housing (614), which prevents the moving plate (62)
4 from movement. Thus, the slanted angle of the moving plate (62) is maintained.

5 With the description above, it is noted that although the slanted angle of
6 the moving plate (62) is able to be maintained, the complex and complicated
7 structure make the manufacture cost high and repairs hard to carry out due to too
8 many involved elements.

9 To overcome the shortcomings, the present invention tends to provide an
10 improved angle adjusting device for a chair to mitigate the aforementioned
11 problems.

12 **SUMMARY OF THE INVENTION**

13 The primary objective of the present invention is to provide an improved
14 angle adjusting device for a chair, with which the manufacture cost is greatly
15 reduced when compared with the conventional one.

16 Another objective of the present invention is to provide a cylinder inside
17 the angle adjusting device to provide the damping effect required when the
18 backrest is inclined relative to the seat.

19 Other objects, advantages and novel features of the invention will
20 become more apparent from the following detailed description when taken in
21 conjunction with the accompanying drawings.

22 **BRIEF DESCRIPTION OF THE DRAWINGS**

23 Fig. 1 is perspective view showing the angle adjusting device of the

1 present invention;

2 Fig. 2 is an exploded perspective view of the angle adjusting device of
3 the present invention;

4 Fig. 3 is a schematic view showing the relative position between the
5 angle adjusting device and the backrest and the seat of the chair;

6 Figs. 4 and 5 are side views showing the movement of the control rod
7 and the resulting movement of the backrest relative to the seat;

8 Fig. 6 is a perspective view showing a conventional adjusting device for
9 a chair;

10 Figs. 7 and 8 are schematic side views showing the interrelationship
11 between the moving plate and the fixed plate in different states; and

12 Figs. 9 and 10 are schematic side views showing a different conventional
13 adjusting device for a chair.

14 **DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT**

15 With reference to Figs. 1 and 2, the angle adjusting device for a chair
16 having a seat (A) and a backrest (B) movable relative to the seat (A) includes a
17 fixed plate (10), a pivotal plate (20), a cylinder (30), and a control member (40).

18 The fixed plate (10) is adapted for engagement with the seat (A) of the
19 chair and has a U shape cross section. The fixed plate (10) is provided with a
20 pivot hole (11) formed on two side faces thereof, an arcuate slot (12) defined in
21 two opposite side faces thereof and a mounting hole (13) defined in a front
22 portion in the two opposite side faces thereof.

23 The pivotal plate (20) is adapted for engagement with the backrest (B)

1 and has two legs (21) extending downward to the opposite side faces of the fixed
2 plate (10) and each leg (21) has a first hole (211) corresponding to the pivot hole
3 (11) and a second hole (212) corresponding to the arcuate slot (12).

4 The cylinder (30) includes a housing (31) with a third hole (311) in
5 alignment with the second hole (212) and the arcuate slot (12), a shaft (32)
6 movably received and extending out of the housing (31) and having an actuating
7 pin (321) extending out from a free end of the shaft (32) to control pressure
8 inside the housing (31). Because the internal structure and function of the
9 cylinder (30) are conventional and well known in the art, detailed description
10 thereof is thus omitted. However, the effect of the cylinder will be incorporated
11 in the hereinafter description.

12 The control member (40) include a control rod (41) and a control plate
13 (42) movable received in the fixed plate (10). The control plate (42) has at least
14 one (two are shown in this preferred embodiment) long hole (421), a fourth hole
15 (422) defined in a distal end of the control plate (42) and an extension (423)
16 extending downward to engage with the actuating pin (321).

17 With reference to Fig. 3 and still taking Fig. 2 for reference, when the
18 adjusting device of the present invention is in assembly, the two legs (21) of the
19 pivotal plate (20) are respectively arranged on opposite sides of the fixed plate
20 (10) to have the first hole aligned with the pivot hole (11) and the second hole
21 (212) aligned with the arcuate slot (12). A first pin (22) is inserted into the
22 aligned first holes (21) and the pivot holes (11) to secure the engagement
23 between the pivotal plate (20) and the fixed plate (10) and allow the pivotal plate

1 (20) to be pivotable relative to the fixed plate (10). The cylinder (30) is then
2 placed in the fixed plate (10) to have the third hole (311) of the cylinder (30)
3 align with the arcuate slot (12) of the fixed plate (10). A second pin (23) is then
4 inserted into and extended out of the second holes (212), the arcuate slots (12)
5 and the third holes (311) to secure the cylinder (30) in the fixed plate (10).

6 A mounting frame (315) is securely mounted between two opposite side
7 faces of the fixed plate (10) and includes an extension hole (316) defined to
8 correspond to the shaft (32) of the cylinder (30). Therefore, after the shaft (32) of
9 the cylinder (30) extends through the extension hole (316) of the mounting frame
10 (315), the actuating pin (321) is extended out.

11 The control plate (42) is secured to a bottom face of the fixed plate (10)
12 by at least one (two are shown in this preferred embodiment) bolt (43) extending
13 through the long hole (421) and into the bottom face of the fixed plate (10) so
14 that the extension (423) engages with the actuating pin (321) of the cylinder (30).

15 The control rod (41) has an axial hole (411) corresponding to the fourth
16 hole (422) of the control plate (42) so that when a securing element (44), e.g. a
17 bolt, is extended through the fourth hole (422) and into the axial hole (411) of the
18 control rod (41), the rotation of the control rod (40) drives the control plate (42)
19 to move. It is noted from Fig. 3 that the control rod (41) is an L-shaped rod and
20 extended into the fixed plate (10) from the opposite side walls of the fixed plate
21 (10).

22 With reference to Figs. 4 and 5, when the control rod (41) is pivoted
23 toward the pivotal plate (20), the control plate (42) is driven to move toward the

1 pivotal plate (20) as well. Due to the engagement of the control plate (42) with
2 the actuating pin (321), pressure inside the cylinder (30) changes to allow the
3 pivotal plate (20), under an applied force, to pivot. That is, the pivotal plate
4 pivots about the first pin (22) in the first hole (211) and the bottom portion of the
5 pivotal plate (20), especially the legs (21), is moved along the arcuate slots (12)
6 of the fixed plate (10). Thereafter, the relative angle of the pivotal plate (20) and
7 the fixed plate (10) is changed. After the inclination angle of the pivotal plate (20)
8 has reached a satisfactory position, the operator releases the control rod (41).
9 Because of the pressure inside the cylinder (30), the relative angle of the pivotal
10 plate (20) to the fixed plate (10) is thus maintained. When the pivotal plate (20)
11 is returned to its original position, the operator operates the control rod (41)
12 again to decrease the pressure inside the cylinder (30), then the operator raises
13 the pivotal plate (20) to resume its original position, which completes the angle
14 adjustment process of the present invention.

15 It is to be noted that the structure of the present invention involves a
16 simple transmission device to activate the pressure change in the cylinder such
17 that the manufacture cost of the angle adjusting device is minimized.
18 Furthermore, due to the minimum quantity of elements involved, the
19 maintenance of the device is easy and inexpensive.

20 It is to be understood, however, that even though numerous
21 characteristics and advantages of the present invention have been set forth in the
22 foregoing description, together with details of the structure and function of the
23 invention, the disclosure is illustrative only, and changes may be made in detail,

- 1 especially in matters of shape, size, and arrangement of parts within the
- 2 principles of the invention to the full extent indicated by the broad general
- 3 meaning of the terms in which the appended claims are expressed.